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FORTIFICATION OF STAPLE FOODS IN MOZAMBIQUE

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FORTIFICATION OF STAPLE FOODS IN MOZAMBIQUE

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FOREWORD

Why Fortification

Fortifying staple foods with vitamins and minerals is widely recognized as one of the most cost-effective and sustainable solutions to combating micronutrient deficiencies such as iron, folic acid, zinc, and vitamin A.

The World Bank and Copenhagen Consensus ranked food fortification as one of the best investments in development in terms of cost effectiveness, as it improves people's health while indirectly boosting productivity and economic progress. Fortification of staple foods has been practiced in North America and Europe since the 1920s and has contributed significantly to global health, improving cognitive ability and physical productivity.

The economics of food fortification has been studied for decades and plays an important role in public policy. Cost effectiveness, as measured by cost per death averted or cost per disability-adjusted life-year (DALY) saved, has helped to give fortification high priority as a preventive health-care intervention. High benefit/cost ratios (comparing the economic benefits and costs of fortification) have swayed government investment decisions, putting fortification in the forefront in public policy regarding social sector investments. As well, private sector has reaped the benefits of fortification through improved public image leading to increased market share and revenues.

A study conducted by WFP in May 2012 showed that in Egypt, employers could gain over \$175 million by reducing levels of anemia in the workforce. The study showed that every \$0.17 invested in fortifying flour for bread in Egypt is estimated to return over \$4.00 to the economy, demonstrating again that fortification is one of the most cost effective public health tools, and beneficial for the national economy as a whole.

Food Fortification's Role

Malnutrition is considered as a complex condition determined by a variety of both micro and macro socio-political, economic, and health-related factors. Among the macro-determinants of malnutrition are: poverty, poor governance, and political instability. Among possible micro-causes of malnutrition are: inadequate infant and child feeding practices, poor hygiene, inadequate food intake, and food insecurity.

Fortification initiatives must be integrated within the context of a country's public health and nutritional program. As part of an overall micronutrient strategy, fortification programs give national governments health, economic, and political benefits; food companies could gain a competitive advantage in an expanding consumer marketplace (domestic and export); and by demanding fortified foods, consumers empower themselves to achieve their full social and economic potential.

The case studies in the *State of Food Insecurity in the World 2014* report show that many countries in Africa, Latin America and the Caribbean have strengthened their political commitment to food security and nutrition.

PREFACE

The Timing is Right for Fortification in Mozambique

In the past decade, Mozambique has progressed in many areas and is now at an appropriate point in which to introduce the large-scale fortification of staple foods. The traditional key factors that are needed for the long-term success of fortification programs:

- Strong development of a local food-processing industry
- Commitment and support of local governments through effective legislation and monitoring
- A consumer culture that perceives gains from investing nominal amounts for personal health

Large-scale fortification of staple foods, an investment in human capital, will allow Mozambique to take advantages of many economic opportunities that are on the horizon, such as increasing foreign investment (Brazil and Japan leading the way) as well as new local enterprises, which will require a strong and capable work force

Vice Minister of Health Nazira Abdula identified the fortification of staple foods as a key strategy to address micronutrient deficiencies, which are common in Mozambique in March of 2011, at a national conference on food fortification. The goal of fortification is to improve the overall health of Mozambicans, especially vulnerable groups, by reducing vitamin and mineral deficiencies. It is also positioned as a way to contribute to the development of local food production, thus boosting the local economy.

At that time, in 2011, it was determined that every year deficiencies in iron, vitamin A and iodine cost the country more than US\$ 119 million; around 1.2 % of the country's GDP. Beyond the economic losses, vitamin and mineral deficiencies are a significant contributor to chronic malnutrition, which affects 44% of children under five.

ACKNOWLEDGMENTS

This report would not have been possible without the support of USAID/SPEED Economists namely Rosario Marapusse and Carlos Matos. The report's findings were obtained based on in-person interviews, which took place in Maputo during the week of September 29, 2014. Meetings were held with: the Ministry of Trade and Commerce, INNAE, INNOQ, private industry representatives from Mecer and Maeva, HKI, GAIN, WFP and UNICEF. In addition to these meeting, visits were made to grocery stores, research was conducted on the internet and email correspondence took place with various experts, organizations and private companies in the fortification space such as DSM, BASF, Flour Fortification Initiative, micronutrient experts and government representative from countries that have mandated fortification.

EXECUTIVE SUMMARY

With the draft legislation that was prepared in August 2013, the government of Mozambique is initiating the first phase of legally mandating the fortification of staple foods. The first foods that are slated for fortification are wheat flour and vegetable oil; both are processed locally and in large-scale operations. Several NGOs have supported this effort, namely Helen Keller International (HKI), the Global Alliance for Improved Nutrition (GAIN) and the World Food Programme (WFP).

In 2012 the entity that will support the implementation of the program, the National Committee on Food Fortification in Mozambique (CONFAM) was created. Led by the Ministry of Industry and Commerce, with the Vice-Presidency held by the Ministry of Health, members of CONFAM include the private sector, relevant government agencies such as Instituto Nacional de Normalização e Qualidade (INNOQ), National Food Inspection Body (INAE), U.N. agencies such as WFP and UNICEF, the consumer protection agency, and the NGOs and donors that support the program, such as GAIN and HKI.

CONFAM's Technical Working Group on Legislation and Quality developed the draft legislation and the accompanying Technical Standards. Both documents are a good starting point, but could be better constructed to ensure a basis for enforcement, to deliver the correct levels of micronutrients and to adequately address imported food products.

HKI held trainings for industry and managed premix subsidy disbursements and GAIN, through the GAIN Premix Facility (GPF), has supported procurement of micronutrient pre-mix and has also funded the purchase of blending equipment, needed to incorporate the pre-mix into the flour or oil at the prescribed ratio.

With this support, several companies, in the oil, wheat flour and maize flour industries, are now fortifying their products. These companies have demonstrated that they are technically capable of fortifying and that the incremental additional cost can be incorporated into their cost structure with less than a 1% increase in cost to the consumer. However, the ongoing participation by industry depends on whether or not government will be able to successfully monitor and enforce the fortification legislation.

The Ministry of Industry and Commerce has informally divided the implementation of the wheat flour and oil fortification program into three phases with the following goals: 50% of the market will fortify by the end of 2015; 75% will be fortifying by the end of 2016; 99% will be fortifying by the end of 2017.

The local refinement of oil comprises roughly 40% of the market and is of 3-4 refiners; seven millers process 90% of the flour that is used for baking commercial bread in Mozambique locally. Monitoring of these 10 companies would be quite manageable and should be the target for this first phase, which runs through 2015. Another goal of 2015 would be to populate a cost-benefit model with current demographic, economic and health data. Tracking the impact of fortification as it enters the market place would enable the government to make a strong case to industry and consumers alike on the benefits of improved health and justification for future funding and support.

CHAPTER 1: FORTIFICATION IN MOZAMBIQUE

NEW FORTIFICATION DRAFT LEGISLATION AND TECHNICAL STANDARDS

In August 2013 the draft legislation was created which first listed wheat flour, maize meal, cassava flour, sugar, oil and salt. According to the Minister of Trade and Commerce, there is a new draft, which will go forward for signature in the next few months. This draft only will address wheat flour and edible oil.

The technical standards, which is a separate document outlining the micronutrient premix formulas for wheat flour, maize flour and edible oil, was based on the Survey on Family Food Consumption Patterns of 2008, and expert consultation with other sources, such as the Codex Alimentarius Commission.

Globally fortification is guided by The Codex Alimentarius Commission, which was established by FAO in 1961. The World Health Organization (WHO) also has published a Guideline to Fortification in 2006, which establishes recommendations for the combination of different vitamin and mineral sources and takes into account local diets.

CONFAM

The present phase of the current fortification program began in 2012. The entity that has facilitate the implementation of this program is the National Committee on Food Fortification in Mozambique (CONFAM) led by the Ministry of Industry and Commerce, with the Vice-Presidency held by the Ministry of Health. Members of CONFAM include the private sector, relevant government agencies such as Instituto Nacional de Normalização e Qualidade (INNOQ), National Food Inspection Body (INAE), U.N. agencies such as WFP and UNICEF, the consumer protection agency, and the NGOs and donors that support the program, such as GAIN and HKI. CONFAM has formed various Technical Working Groups.

The Technical Working Group on Legislation and Quality also followed a participative process to develop draft legislation. Participants in workshops held to develop the legislation included the private sector companies; Ministry of Industry and Commerce; Ministry of Health; INNOQ; INAE, UNICEF, World Food Programme, HKI, World Vision, Consumer Protection; European Union; UNIDO; Irish Aid; SETSAN; the National Laboratory (Laboratorio Nacional de Higiene de Alimentos (LNHAA); and an international consultant, Dr. Phillip Randall.

Best practices in fortification from other neighboring Africa countries were taken into account when creating the draft legislation and technical standards. As Mozambique imports much of its food from neighboring countries, it was important to consider the impact of requiring the fortification of imports from countries that do not currently fortify foods targeted in the legislation.

CHAPTER 2: REVIEW OF DRAFT LEGISLATION AND TECHNICAL STANDARDS

The draft legislation has been constructed to serve as a general structure under which all the fortification can be implemented. Several foods have been identified as appropriate for fortification, but at the current time only wheat flour and vegetable oil fortification will be enforced.

THE ELECTED STAPLE FOODS

Wheat Flour fortification is a good choice

Tanzania, Kenya, Uganda and South Africa all require mandatory fortification of wheat flour. Wheat flour is one of the most common foods to be fortified on a large scale and is currently mandatory in 79 countries. It is estimated that 31% of the world's industrially milled wheat flour is now fortified with at least some iron or folic acid through mandatory and voluntary efforts.

However, in conjunction with wheat flour, maize flour fortification should also be mandated. The consumption of both staples varies from region to region in the country, but the average per capita consumption of wheat is so low (approximately 50 grams per day) that the fortification's impact will not be significant and for that reason maize flour should be included.

Vegetable Oil fortification could be problematic

According to a local industry manager, up to 60% of the vegetable oil sold in Mozambique is imported. The only African country to mandate oil fortification is Nigeria and the countries from which Mozambique imports, mainly South Africa and Portugal, do not require fortification. It could be difficult to require importers to fortify with Vitamin A and D.

As well, additional quality control measures need to be in place when fortifying with Vitamin A, a very fragile vitamin highly sensitive to heat and light, and to the peroxide level in oil, which can be high in lower quality brands. To optimize and sustain vitamin A levels in fortified oil, governments should not allow the peroxide level to be higher than 2 mEq/kg at production.

THE DRAFT LEGISLATION

The table below summarizes the chapters and articles of the legislation. As noted, many of the articles refer to the Technical Standards and some articles lack a reference point, but if one exists, it should be noted, such as a Quality Control Manual.

TABLE 1: DRAFT LEGISLATION, EACH ARTICLE'S TERMS OF REFERENCE

Chapter 1 - General Provisions			
Article	Topic	Summary	Reference
1	Object	to fortify staple foods	None needed
2	Scope	5 staple foods	None needed
3	Definitions	terms defined	Glossary
4	Requirements	all food produced locally, imported or exported must be fortified, <i>except food from subsistence farmers</i>	Technical Standards
Chapter 2 - Fortification of food products			
Article	Topic	Summary	Reference
5	Technical Specifications		Technical Standards
6	Fortification levels		Technical Standards
7	Labeling		Technical Standards
8	Exclusive Use of Terms	"fortified" and "iodized"	None needed
9	Condition for the use of logo		Technical Standards
10	Fortificant Pre-mix	registering of pre-mix supplier	COA required
11	Assesment of Conformity	QC & QA by producers	Quality Control Manual
Chapter 3 - Supervision, inspection			
Article	Topic	Summary	Reference
12	Supervisory Body	inspection at least once a year	Quality Control Manual
13	Criminal Procedures	violations of these regulations will be considered "criminal"	Schedule Needed
14	Denunciation	anyone can file a complaint against a non-compliant company	Schedule Needed
15	Sample collection & specialized test	collection and analysis of sample shall take place	Quality Control Manual
Chapter 4 - Sanctions			
Article	Topic	Summary	Reference
16	Punishment	finest for non-compliance	Schedule Needed
17	Repeat Offenses	finest for repeat offenses	Schedule Needed
18	Payment of Fine	how fines shall be paid	None needed
19	Destination of the fine	destination of fine monies	None needed
Final Provisions			
Article	Topic	Summary	Reference
20	Omissions		

There is a quality control manual for private sector; however, this is not referred to in the draft. Many of the articles that describe sanctions must refer to an implementation schedule in order to be enforceable and enable the government to impose fines for non-compliance.

ENFORCEMENT MECHANISMS

The Draft discusses in very general terms the monitoring process and the punishments for non-compliance.

SAMPLING AND TESTING

INAE shall collect samples at all retail, production and / or other outlets, where types of food products covered by these Regulation are handled and / or order tests and specialized analyzes of these products, and report their findings to the Technical Unit for the Fortification of Food Products.

The draft does not detail how this sampling and testing will be done, nor does it refer to the technical standards. The guidelines for how and when product will be tested should definitely be part of the technical standards, as each food must adhere to distinct monitoring processes. For example, the testing of flour will require different parameters than the testing for oil, or sugar, or salt. However, there are several general points that should be considered when implementing the sampling and analysis. These are described below.

Only sample from the market and test only a few micronutrients

It is quite standard to randomly sample and test fortified foods in the market place. It is not common to test at production or at ports of entry as this can be costly and inefficient for both the producer and the government tester.

To test for all micronutrients in a complex formula, such as the one utilized for wheat flour, is quite expensive and not often done. All micronutrients can be tested at certification, but it is most practical to test for iron and perhaps one B vitamin, for wheat flour, and vitamin A, with oil, and to expect a range of results. Do not tell producers that they will only be tested for these two and vary the chosen vitamin B to ensure that producers do not take advantage. The testing should look for result in a range. This range should be part of the technical standards. Currently the standards sight a minimum amount and then an upper level at which a micronutrient would prove toxic. This is different from establishing an acceptable range, which would be tied closely to the blend ratio.

A couple of things to keep in mind when testing: B9 (folic acid) is extremely difficult to test for and there are a variety of testing methods that can be used which can provide a range of results; iron and vitamin A should be tested together in the wheat flour from time to time to make sure that the iron compound is not degrading the vitamin A. Often an encapsulated vitamin A is used with iron to avoid this degradation, however, this can be 30% more expensive. Mozambique is not requiring encapsulation vitamin A.

The Draft Legislation does not set forth an implementation plan with regards to which producers will be required to fortify and by what time.

FORTIFICATION SCHEDULE: EFFECTIVE DATE/GRACE PERIOD

After the legislation has been signed, there will be a grace period of 1 year until the wheat flour and oil industries will be monitored in order to confirm compliance. This is a generous grace period by global standards (most countries allow only a 6 month grace period) and should be sufficient to allow the majority of large locally processed wheat flour and oil to start fortifying.

The Ministry anticipates that the legislation will be passed by the end of the year. At the time of signing, a one-year grace period will begin and it is anticipated that compliance will follow accordingly:

TABLE 2: WHEAT AND OIL FORTIFICATION IMPLEMENTATION SCHEDULE

By the end of	% of producers/importers compliant
2015	50%
2016	75%
2017	99%

The Ministry of Trade and Commerce verbally communicated this schedule to the author, however, there does not seem to be a documented schedule. It would be wise to establish one that takes into consideration the different sizes of local producers as well as importers. In that way, clear expectations would be established and without clear expectations, it would be difficult to impose punishments for non-compliance. An example of such a schedule, which addresses large and medium wheat millers, is below. Such a schedule can be developed for all foods and should be tailored to the structure of local industry and imports:

TABLE 3: EXAMPLE OF AN IMPLIMENTATION SCHEDULE THAT COULD BE REFERENCED FOR COMPLIANCE

Food	Producer		Must Comply By
	Local	Import	
Wheat Flour	380-250MT/day		January 2016
Wheat Flour		380-250MT/day	January 2017
Wheat Flour	250-100MT/day		January 2017
Wheat Flour		250-100MT/day	January 2018
Wheat Flour	100-50MT/day		January 2018

PUNISHMENT

In this section of the draft two types of infractions are described:

The punishment for not fortified the foods to the established standards is incurs a fine corresponding to three times the market value of the product in case plus the withdrawal of the food product.

The punishment for not registering the product with the ministry and following the labeling guidelines will be a fine of 40 times the minimum wage prevailing in the manufacturing industry,

Second offences will result in a doubling of these fines; a third offence will result in the suspension of a producer license.

IMPLICATIONS FOR IMPORTED PRODUCTS

These punishments apply to both locally produced product and imported, which is not reasonable. It should be noted that imported fortified products would generally adhere to their local fortification standards. The Minister should accept these standards if they are within a reasonable range (for example South Africa's wheat fortification formula varies from that of Mozambique, but is quite similar).

There is always the possibility that importers will be willing to fortify to Mozambique standards. In the case of oil, the process is quite simple and could be done at the point of entry. This is an area that needs to be considered closely, however, and if other standards will be accepted it should be noted in the draft. Either way, allowing for a bit more time for importers to comply would be reasonable. As the example schedule shows in Table 4, importers would have a longer grace period than local large producers, but once the grace period ends, INNAE would be free to enforce. COMFAM should identify large importers, if they have not done so already, and begin to educate these producers on the new fortification standards and expectations.

TECHNICAL STANDARDS

CONFAM's Technical Working Group on Legislation and Quality led the process of establishing the technical standards for fortification. Industry representative were consulted during this process of developing the technical standards, along with all the CONFAM members.

The Technical Standards drew from several studies in Mozambique, which pointed to the large consumption of food products common to the whole country: maize, cassava, beans, sweet potato, peanuts and cashew. As well, the technical standards were influenced by the results of the Survey on Family Food Consumption Patterns of 2008, which indicated four industrially processed products in Mozambique that lend themselves to fortification: maize flour, wheat flour, oil and sugar. The results of the study indicated that large scale fortification of several food products would be most efficient in covering the urban population, due to it offering the following advantages: larger and more effective coverage, operational success, effective monitoring and efficient provision of the necessary micronutrients.

These Standards are detailed in a separate document that is managed by INNOQ, with hard copies available for purchase by industry, for approximately 1,500 MZN. The strategy to keep these standards separate from the draft legislation, allows modifications to be made without changing the legislation. It is reasonable to think that micronutrient formulas will be modified and trends in consumption evolve.

The standards include:

- Lists of technical references for the selection of micronutrients – sources and levels – and the methods used for laboratory analysis and quality control.
- Lists of microbiological tests to be included in the analysis of the products, and the accepted limits for each item.
- Lists of the tests for heavy metals to be included in the analysis of the products, and the accepted limits for each item.
- Characteristics for all the different types of flour and the different types of oil for which this requirement address
- Lists of micronutrient premix recipes for wheat flour, maize meal and oil.
- Storage condition for the premix
- Suggested protocol for handling of the premix

- Specifications/branding guidelines for use of the fortification logo – placement, color, etc.

These all appear to be quite complete and address all the technical aspects of the premix, and testing.

MICRONUTRIENT FORMULAS

The standard include formulas for wheat flour, maize meal and oil, even though the current legislation will only cover wheat flour and oil. In general the micronutrients and their levels are fairly standard and in accordance with WHO guidelines. Much of the wheat is imported by South Africa and so it is useful to compare the micronutrient formulas:

TABLE 4: WHEAT FLOUR MICRONUTRIENT CONTENT: MOZAMBIQUE VERSUS SOUTH AFRICA

Mozambique			South Africa		
Wheat Flour		mg/Kg	Wheat Flour		mg/Kg
Iron	NaFeEDTA	20			
Iron	FERROUS SULPHATE	20			
Zinc	ZINC OXIDE	30	Iron	Iron EDTA	47.97
Vitamin B12	VITAMIN B12 1 % SD	20	Zinc	ZINC OXIDE	26.73
Folic Acid	Folic Acid Food Grade	2	Folic Acid	Folic Acid Food Grade	1.24
Vitamin A *	VIT A PALM 250 S/N	2	Vitamin A	VIT A PALM 250 S/N	1415
Vitamin B1*	THIAMINE MONONITRATE	5	Vitamin B1	THIAMINE MONONITRATE	3.79
Vitamin B2*	RIBOFLAVIN	4	Vitamin B2	RIBOFLAVIN	1.95
Vitamin B3*	NIACINAMIDE	45	Vitamin B3	NIACINAMIDE	54.76
Vitamin B6*	PYRIDOXINE HYDROCHLORID	6	Vitamin B6	PYRIDOXINE HYDROCHLORID	3.07

Reference to serving size is needed

The formulas that were developed for the fortified wheat flour and maize flour reference a serving size of 100 grams, which also represents the average daily consumption per capita. If this were true, that would represent per capita consumption on an annual basis of 36.5 kg. But if we were to look at the annual average consumption of these staple foods, we will see that wheat flour is 20 kg and corn meal is 58 kg. It is important to remember that these numbers are national averages and don't take into consideration the differences in regional consumption patterns. As a rule, however, average serving sizes are taken into consideration when fortifying. For instance with regards to rice fortification, formulas are calculated based on a serving size of 120 grams in Bangladesh, 55 grams in Brazil and 65 in Columbia.

Below is a table of per capita consumption of Mozambique, South Africa and Tanzania, which shows the difference between annual consumption:

TABLE 5: WHEAT FLOUR PER CAPITA COMSUMPTION

Wheat Flour per capita consumption	daily grams	annual (kg)
standard used for fortification	100	36.5
Mozambique	55	20
Tazania	23	10
South Africa	163	59.65

FAO 2009

ADDITIONAL TECHNICAL DOCUMENTS ARE NEEDED

Private sector has said that there is a quality control manual. This manual has not been reviewed, but must contain standard operating procedures for blending, and recommended dosing equipment. This information will be most critical when medium and small producers are asked to fortify, and many of these producers will be less sophisticated and will need support in selecting blending equipment and developing procedure within their operations to accurately blend.

In addition to blending protocol, several other types of documents will be needed. In January 2014, HKI held technical industry training working shops for industry. The notes from those workshops mentioned that several documents were in process. If those have been completed and validated, they should be added to the Technical Standards:

- Manuals for internal QA/QC and internal auditing
- Manual for the regulators to conduct external inspections and auditing of wheat mills
- A “Code of Practice” (COP) which covers fortification from premix procurement to final point of sale.

CHARGING FOR TECHNICAL STANDARDS

A few countries still follow the custom of selling hard copies of technical standards. While this does provide a source of income for the Ministry and a way of tracking private sectors involvement, it would be recommended to post these technical standards on-line for various reasons. It is important that everyone, not only interested private sector, have access to the list of micronutrients and their levels that will be added. As updates are made to the formulas, these will be available and there will be no question as to the latest version.

LEVERAGING THE FORTIFICATION LOGO

A better way to generate revenue and track industry is to ask industry to pay for INAE to “certify” their products: pre-mix from a certified supplier, hygienic working conditions, use of a tested blending protocol that produces accepted CoV (coefficients of variation).

Once companies become certified they will be granted the use of the fortification logo and will be able to be included in the group of companies that have joined the government’s fight to stop micronutrient malnutrition.

COMFAM can design a social marketing campaign to alter consumers to fortified products once they are in the market place. An example of a social marketing campaign for fortified rice in Brazil, which was supported by PATH, could provide some ideas for communicating in Mozambique. Arroz Vitaminado: <http://www.arrozvitaminado.net.br> Rice millers were granted rights to use the logo only after they paid the yearly fee and were “certified” by federal university inspectors.

For this campaign many celebrity endorsements were obtained free of charge as the products benefit public health. The producers saw an increase in their market share as their products were promoted in the campaign.

CHAPTER 3: PRIVATE SECTOR PARTICIPATION

Several members of private industry have been represented at CONFAM meeting since its inception. Industry representatives have contributed to the formation of the draft legislation and to the technical standards.

Local Food Processing in Mozambique

The last few years have seen a slow but steady growth in the agricultural sector, overall growth from 2011 to 2012 was calculated at 8.4 percent, according to, Mozambique’s Agriculture Minister, José Pacheco.

With regards to processes of wheat flour and oil, several large corporate entities have entered the market in the last decade. In 2013, Bakhresa Grain Milling, the largest producer of wheat flour in East Africa and a subsidiary of Tanzania-based Bakhresa Group, opened a \$30-million facility, for milling hard wheat and semi-hard wheat into flour for bread making, in Nacala.

Further investment in food processing and agriculture is expected with the development of the Mozambican Commodity Exchange (MCE).

Voluntary Fortification

In the past few months a handful of companies have begun to fortify voluntarily. HKI purchased dosing equipment for millers and oil refiners. As well, producers that were interested in fortifying could draw on an HKI subsidy for premix purchased through the GPF. If a company wishes to

purchase elsewhere, they are free to do so, but the subsidy is provided only when they purchase from the GPF. After this first year of purchases, the subsidy will have been exhausted.

TABLE 6: HKI'S BUDGET FOR THE PRE-MIX SUBSIDY

Industries	Value of Premix Subsidy (USD)
Wheat/Corn Mills	\$ 535,368.00
Oil Refineries	\$ 179,917.00
TOTAL	\$ 715,285.00

The dosing equipment provided to the mills was Buhler equipment that cost on average of US\$15K per unit. The majority of the milling equipment used by large millers (both wheat and maize) is manufactured by Buhler, a high quality Swiss equipment manufacturer that has a joint venture with DSM, the largest global micronutrient supplier and also a premix supplier that has been selected through the GPF to supply premix for Mecer's wheat fortification.

Premix supplied through the GPF, to both flour mills and oil refiners, was purchased through a competitive tendering process and a total of five different GPF-approved premix suppliers have delivered premix to the industries.

We know that at a minimum, one wheat flour miller, one maize miller and two oil refiners are currently voluntarily fortifying and procuring through the GPF. One oil refiner is purchasing directly from BASF of Germany, the largest supplier of vitamin A globally, and is not taking advantage of the subsidy.

Efficiencies increased by allowing free choice

The GPF is quite useful for aggregating demand from smaller producers to enable purchasing in bulk, which cuts material and transport costs. It is not, however, very useful for large producers who regularly procure large amounts of raw materials. In the case of Mozambique, the most practical market from which to obtain premix is South Africa, which has fortified for years.

Buhler's line of industrial equipment is considered "top of the line" and in most cases is the most expensive equipment on the market, which may be appropriate for large sophisticated producers such as Mecer and CIM, but it may not be suitable for medium and small producers. In other countries it has been common for industry players to jointly design and build equipment that is low cost, yet customized for specific milling environments.

MILLING OVERVIEW

Wheat consumption in both rural and urban areas has been growing steadily over the past several years (ref). Although less than 1 percent of the total supply of wheat comes from domestic production, there are large scale milling operations and this is a commodity that has

seen increases in consumption in both rural and urban zones, due to the consumption convenience of bread and other wheat flour products.

In many parts of northern Mozambique, maize is seen as a cash crop, but is also milled into flour at the large mills in the country.¹

Milling companies in Mozambique can be classified into 2 categories:

- Medium to large-scale organizations that mill mostly wheat and maize
- Small-scale organizations that mostly mill maize and cassava (less than 5 mt/day)

Medium to large-scale Millersⁱ

- There are about eight medium to large millers in Mozambique who have milling capacities ranging from 50 MT/day to 380 MT/day

Small-scale Millers

- Small-scale millers process less than 5 MT of grain per day, but many typically mill less than 1 MT. A typical mill might have 1 – 3 hammer mills and they mill locally produced cereals for local consumption. The customers either grow their own cereals or purchase un-milled supplies in the market and bring for milling, for which the owner charges. Batches of 3 – 15 kg of grain may be milled at a time, feeding a household for up to 2 weeks. This flour is not normally packaged and none of the millers know about, or had the equipment, for fortification. The operational aspects of these mills varied from very good to very poor.²

TABLE 7: WHEAT IN MOZAMBIQUE

Commodity	Local	Import	Exports	Imports as a % of consumption	Exports as a % of production
Wheat	10	429	2	0.99	<1%

Source: MIC, 2009.

¹ Staple food prices in Mozambique, Prepared for the Comesa policy seminar on “Variation in staple food prices: Causes, consequence, and policy options”, Maputo, Mozambique, 25-26 January 2010
under the Comesa-MSU-IFPRI African Agricultural Marketing Project (AAMP)

MEREC INDUSTRIES LDA (MEREC)

The wheat milling industry in Mozambique is highly centralized, with 3 players making up 64% of the market (HKI). We met with Meref Industries Lda (Meref), which was established in 1998 and is today the largest wheat miller in Mozambique.

They have been voluntarily fortifying their flour in the past several months and have been drawing on the GPF to source their premix. Their packaging states that they are fortifying with 8 micronutrients at certain levels, they do not list B12 in their formula. Currently, they are only fortifying with iron, zinc, B12 and folic acid and are not including the vitamin A and B12, as these are not required.

The company is sourcing their premix through the GPF, which they have not been happy with. The reason for this is that it takes too long from the time the order is placed to receive the goods. They would prefer to source on their own and gain efficiencies.

The vendor who was selected through the GPF is Royal DSM, a Dutch company that is the largest supplier of micronutrients in the world. The pre-mix was sourced from their South African office and prices for the premix were obtained for this report from that office.

The cost of fortifying one metric ton of wheat flour with pre-mix at an incorporation rate of 380ppm would be between USD\$6.85 and 4.40 depending on the amount. Shipping cost will also vary depending on frequency and amount; it is also unclear as to the additional cost for internal transport to mills. A transportation fee of US\$1,000 per month is incorporated in the above costs. Meref has stated that they would prefer monthly shipments as many nutrients have short shelf life.

TABLE 8: MARGINAL COST OF WHEAT FLOUR FORTIFICATION

additional cost per kilogram	
retail price per kilo	MZN
domestic fortified wheat flour	22.00
imported fortified wheat flour	33.00
theoretical price increase	
additional cost per kilogram	MZN
retail price per kilo	22.00
cost for fortification	0.14
total	22.14
percent increase	0.63%

Another common model for calculating the additional cost of fortification has been developed by FAO. This is using the premix cost per MT and then derives additional capital expenses and operation cost for private industry as well as control costs for government and social marketing/education expenses, based on a percentage of the total pre-mix costs.

TABLE 9: ESTIMATED COST OF WHEAT FORTIFICATION FOR PRIVATE SECTOR & GOVERNMENT

	Inputs	Cost (USD)
Annual local production (MT)	312,000	
Cost to fortify a MT (USD)	\$ 4.40	
Private Sector Costs		
Premix		\$ 1,372,800
Capital Costs of 10 years	5%	\$ 68,640
QC	5%	\$ 68,640
		\$ 1,510,080
Government Costs		
Regulatory Enforcement	3%	\$ 41,184
Nutrition Surveillance	3%	\$ 41,184
Social Marketing/Education	10%	\$ 137,280
		\$ 219,648
Total Costs		\$1,729,728.00

Source: FAO

At a per capita consumption of 55 gr of wheat flour a day, this additional cost of fortification is equivalent a maximum of to only US\$ 0.25 per year. However, Mozambique mills approximately 312,000 metric tons of flour per year and fortification costs would come to some US\$ 1.7 million per year. While the incremental cost can be incorporated into the product price, millers will not be inclined to compete against a non-fortified alternative. For this reason the fortification standard must be enforced making the competitive rules equal for all.

EDITABLE OIL OVERVIEW

The local production/refinement of oil comprises 35% of the market in Mozambique. The other 65% of the market is supplied by imported refined cooking oil, mainly from South Africa and Portugal. These oils are refined and packages in their respective countries and imported to Mozambique for sale. Neither South Africa nor Portugal has enacted mandatory oil fortification,

however Tanzania does have a mandate for oil fortification and could consequently be a market opportunity for exporting Mozambique oil.

TABLE 10: EDIBLE OIL IN MOZAMBIQUE

Oil Market to meet local consumption	MT
Local Production/Refinement	68,950
Imported	128,050

MAEVA GROUP

We met with the manger of Maeva group operation in Maputo. The factory was opened in April of 2010 and is an investment of the French group Shemir Sokataly. It produces 500 tons of oil per day and imports the raw materials from Singapore, Malaysia and South Africa. A portion of the oil produced at the factory is sold in Mozambique, and represents 7% of the total market (local & imported) market. The majority of the production is exported to Tanzania, Madagascar and Burkina Faso. Tanzania passed regulation for fortified oil in August 2011,

Maeva attended the original meetings held by CONFAM and are supportive of the fortification, but Maeva has not accepted any support from the group for training or subsidies. For the past seven years they have voluntarily fortified their oil with vitamin A and Vitamin D. They are not purchasing through the GPF, but rather going directly to BASF, a Germany company that specializes in vitamin A from. Several years ago BASF developed a QC kit for vitamin A that is quite effective in testing the product prior to shipment. Maeva has purchased several of these kits and is utilizing them in their plants.

The Maeva manager seemed to know quite a bit about fortifying with vitamin A (Retinyl Palmitate), a very fragile micronutrient that rapidly degrades in heat and light, and explained the process that was used and QC measures in place.

When asked why Maeva was not using the fortification logo in their packaging, the manager answered that the company was using existing labels, but had order labels with logos and would use these once the other ran out. He also stressed that as labeling was not obligatory, he was in no hurry.

Unlike Merec, Maeva stated that the are fortifying because the owner is French, understands the value of fortification and is doing so because of a sense of social responsibility. He does not know if other oil refiners are fortifying and does not see the extra cost and something that will damage the competitiveness of the Maeva product.

It is not clear which oil producers have taken advantage of the subsidy through the GPF. Consequently I do not have any pricing for this premix and so will just use global standard pricing.

This standard pricing will be used in the model for calculating the additional cost of fortification that has been developed by FAO. This is using the premix cost per MT and then derives

additional capital expenses and operation cost for private industry as well as control costs for government and social marketing/education expenses based on a percentage of the total pre-mix.

TABLE 11: ESTIMATED COST OF OIL FORTIFICATION FOR PRIVATE SECTOR & GOVERNMENT

Inputs		Cost (USD)
annual consumption (MT)	197,000	
Cost of of fortification per MT	\$ 2.15	
Private Sector Costs		
Premix		\$ 423,550
Capital Costs of 10 years	5%	\$ 21,178
QC	5%	\$ 21,178
		\$ 465,905
Government Costs		
Regulatory Enforcement	3%	\$ 12,707
Nutrition Surveillance	3%	\$ 12,707
Social Marketing/Education	10%	\$ 42,355
		\$ 67,768
Total Costs		\$533,673

Source: FAO

KEEPING PRIVATE SECTOR ENGAGED

In addition to Merec and Maeva, a large maize producer, Companhia Industrial da Matola (CIM) is voluntarily fortifying their product, Top Score Maize Meal, which is the most common brand in Maputo grocery stores. It is not clear whether or not they are taking advantage of the GPF or whether they attending training by HKI, but the formula they are printing on their label adheres to the standards.

The fact that three large food producers are currently fortifying is proof that they are technically capable. Maeva is absorbing all the incremental cost and remaining competitively priced in the market. Merec, and possibly CIM, are taking advantage of the GPF subsidy and have accepted blending equipment and technical support. However, Merec has stated that they understand the value in fortification and are more than willing to continue fortification and cover the cost. As noted earlier, the marginal cost of fortifying wheat flour is less than 1% of the total cost and so it is quite affordable within the context of large-scale food production.

The government's wheat flour subsidy was reviewed in order to determine whether or not the lifting of the subsidy would preclude the feasibility of fortification.

TABLE 12: GOVERNMENT SUBSIDY FOR WHEAT FLOUR

	2013 (MZN)	2013 (USD)	2014 (MZN)	2014 (USD)
subsidy per kg	4	\$ 0.13	2	\$ 0
subsidy total	615,300,000	\$ 19,471,519	350,000,000	\$ 11,111,111
amount of flour (KG)	153,825,000		153,825,000	
amount of flour (MT)	153,825		153,825	
annual consumption (MT) @ 55gr	516,600		516,600	
subsidy addresses % of consumption	30%		30%	

Currently, the subsidy is reducing the cost per kilogram by 2 MZN, which is 10% of the retail price per kilo of 22. It is assumed that the government will further decrease this subsidy, or remove it all together. For 2014, the budget for this subsidy was US\$11M.

Below is a theoretical breakdown of how the wheat milling industry might absorb the cost of fortification, also considering that the subsidy would terminate. The key number here is the cost of goods sold.

TABLE 13: THEORETICAL PRICE INCREASE

KG price of wheat flour	MZN
current retail price per kg	\$ 22
price w.o subsidy	\$ 24
Cost of Goods Sold	\$ 21
.7% cost for fortification	0.170
profit margin of 10%	\$ 3
TOTAL	24.35

However, regardless of future subsidies, Merec and CIM appear to be very capable of continuing to fortifying and absorbing the additional incremental cost. The key to ensuring their continued participation is to allocate the resources needed to build strong capacity in monitoring and control. In addition, government can further encourage industry by waiving import taxes for pre-mix shipments from South Africa.

It has been demonstrated that the incremental cost for fortification does not prevent participating companies from staying competitive in the market, even when government subsidies for wheat flour end. Other incentives for private sector could be created by developing and communicating a value proposition, which would detail how fortification, supported by a social

marketing campaign, paid for at least in part by the government, could increase local market share and uncover new opportunities for exporting to countries that fortify: South Africa, Tanzania, Kenya and Uganda for wheat flour fortification and Tanzania for oil fortification.

CHAPTER 6:

RECOMMENDATIONS

SUMMARY

Mozambique's fortification program is off to a great start. There has been solid involvement from a variety of stakeholders to develop the draft legislation and the technical standards. What follows are recommendations that would make the draft and standards more robust and also suggestions for working with the private sector to implement the program within the Ministry's time frame. Finally, there is a description of a cost/benefit model that should be used at baseline to assess the fortification initiative as it progress and secure on-going support for the program

DRAFT LEGISLATION

Article 4 (Requirements) and Article 6 (Fortification levels) requires that the named food be "properly fortified in accordance with the prevailing Mozambican Standards." and "The food products mentioned in these Regulations shall be fortified according to the levels defined in the relevant Mozambican Standards; Fortification levels are changed by revision of the relevant Mozambican Standards."

As these requirement covers imported foods, it is not realistic to assume that importing countries will fortify to Mozambican Standards. Additional verbiage to this article might be:

"It should be noted that imported fortified products will adhere to their local fortification standards and that these standards will be accepted if within a reasonable range as dictated by the relevant Mozambican Standards."

For example, South Africa's wheat fortification formula varies from that of Mozambique, but is quite similar and should be accepted.

Article 7 (Labeling) requires that fortified food producers label their products in accordance with the standards and that these efforts should be communicated with the Technical Unit for the Fortification of Food Products of the Ministry of Industry and Commerce.

Once again imported product are not considered and while requiring standard labeling is applicable for locally produced food, it is not something that importers will follow, if the products are packaged before entry to Mozambique (see above). The Article could acknowledge this distinction by changing the title to: *"Labeling for Locally Produced Food or Food packaged in Mozambique"*

Article 9 (Conditions for the use of the logo) requires that, “The use of the fortification logo shall comply with the provisions in the Mozambican Standards”

Once again imported product are not considered and these products would not display the logo unless they were re-packaged in Mozambique. To clarify this, the title of the Article could read, *“Conditions for the use of the logo with locally produced food or imported food that is repackaged in Mozambique.”*

As well, it is often useful to grant the right to use a fortification logo in conjunction with certification. For example, those producers that wish to display the logo on their products must allow a member of INNOQ to certify their product. The producer will pay for this certification and once approved, will be officially granted the logo. Producers will need to periodically renew this certification in order to display the logo and will be charged a fee for each certification. The logo will be promoted in the government’s social marketing campaign for the initiate, providing free (or shared cost) advertising for fortified brands. In this way, the Ministry will build value for the logo, generate revenue and also control quality. An addition to this Article could be, *“In order to be granted use of the logo, the producer must comply with the provisions in the Mozambican Standards and certify their standard operating procedures and final product with INAE according to the Mozambican Standards.”*

Article 10 (Fortificant/Mistura de Fortificação) requires that micronutrient pre-mix manufacturers register with the Technical Unit for the Fortification of Food Products in accordance with the respective Guide of procedures. The responsibility for this registration should belong to the food manufacture.

Local producers or Importers of fortified foods should ask to be provided a Certification of Authorization from the micronutrient manufacture. This is standard procedure, but it is unreasonable to ask that a supplier (micronutrient manufacture) to the imported product register with the Technical Unit for the Fortification of Food Products.

The text could be clarified this way, *“Producers, marketers and importers of wheat flour and vegetable cooking oil must use a qualified micronutrient pre-mix supplier and must register this supplier’s Certification of Authorization with the Technical Unit for the Fortification of Food Products.”*

Article 12 (Supervisory body) details the monitoring of producers for compliance with the provisions of the regulations. If the logo will be tied to certification, as recommended, this would be a good place to reiterate that *“The annual monitoring of a producer’s standard operation procedures for fortification, and payment of annual dues, will be required for the use of the logo and the inclusion of the producer’s brand in government marketing campaigns for fortified foods.”*

Article 16 (Punishment) once again does not take into account variation in micronutrient formulas that may come in imported foods. In section 2 and 3 a few words can be added at the end to clarify this, *“fortified in accordance with the prevailing Mozambican Standards, or in accordance with fortifying standard of the country of origin, assuming that these standards meet minimal requirements as stated in the Mozambique Standards.”*

TECHNICAL STANDARDS

These standards are well defined with regards to standard quality control measures in food production: microbiological testing requirements, heavy metal testing, etc.

Micronutrient Levels

The standards also give the formulas for wheat flour, maize flour and vegetable oil. The formulas for both the wheat flour and maize flour have been developed for serving sizes of 100 grams.

According to FAO the average person in Mozambique consumes 20 kilograms of wheat flour annually, which translates to 55 grams per day. Mozambique's Technical Standards call for 20 mg of iron EDTA and 20mg of ferrous sulfate per kilogram of wheat flour. South African's consume 163 grams per day and their formula contains 48 mg of iron per kilogram. The same holds true for the zinc and vitamins.

Increasing the micronutrient levels in the formula to better correspond with per capita consumption amounts would improve the benefits of the fortification without increasing the price significantly. This option should be discussed and explored.

Add Requirement for Maize Flour Fortification

Several large millers in Mozambique mill both wheat and maize and so can, and should, fortify both. Economies of scale can be achieved, as the premix formula for both wheat and maize is the same, with very slight modifications. The per capita consumption of wheat flour is so low that simply fortifying this food only will not impact iron stores significantly.

Additional Technical Documents are needed

In January 2014, HKI held technical industry training working shops for industry. The notes from those workshops mentioned that several documents were in process. Once these are completed and validated, they should be added to the Technical Standards:

- Manuals for internal QA/QC and internal auditing
- Manual for the regulators to conduct external inspections and auditing of wheat mills
- A "Code of Practice" (COP) which covers fortification from premix procurement to final point of sale

Access to Technical Standards

The Technical Standard should be posted on-line for many reasons:

- It is considered best practice to disclosure publically mandated nutrients and their levels.
- Private industry would be more incentivized by paying for a "certification" that will give them free or reduced cost advertising.
- As updates are made to the formulas, these will be immediately available and there will be no question as which is the latest version.

IMPLEMENTATION OF FIRST PHASE:

50% of the wheat flour and vegetable oil market fortifying by the end of 2015

Industry tells us that:

Wheat Flour

- 100% of wheat flour used for bread is locally milled

- 90% of locally milled flour is produced by 7 millers
- Merec produces 40% of locally milled flour

Vegetable Oil

- 40% oil is refined locally
- 60% oil is imported, mainly from South Africa or Portugal
- Maeva produces 20% of locally refined oil

The focus, during this first phase, should be to work with the large producers that are currently voluntarily fortifying: Merec (wheat flour) and Maeva (veg. oil). CIM (maize flour) is also fortifying voluntarily, and even though this first phase only covers wheat flour and oil, CIM should be encouraged and supported.

It does not appear that these large producers need financial support to pay for the on-going incremental cost of fortification, however, there are several things that the government can do to incentivize these producers, making them a model for the rest of their industries.

Better understanding of these industries is necessary to be able to target the largest local and imported producers for this first phase.

Communicate to Retailers:

- Retailers ultimately decide the price of new products. Often retailers will consider “fortified” products a value-add product and will price them higher, even though the wholesale price remains the same as non-fortified products. Communicate to retailers the goals of the program will help set expectation and let them know that they will be acknowledged in social marketing campaigns.

Communicate to Consumers:

- Educating consumers will enable them to advocate for themselves and demand that food is fortified, which can motivate smaller producers to fortify in the near future.
- Design social marketing campaigns that benefit retailers and producers. Suggest that producers help cover the costs for fortification centered campaigns that make use of celebrity endorsements, the fortification logo and position Mozambique as a leader in nutrition.

Enforcement and Taxes:

During our interviews with private sector, it became clear that they are more than willing to comply with fortification mandates as long as the government adheres to their schedule and imposed/enforce fines for non-compliant mills.

- The Flour Fortification Initiative has been contacted and is well equipped and able to conduct food control system training as needed by INAE. Work with industry to determine what will be needed in for certification and ongoing random sampling during this first phase. Once those parameters are defined, contact FFI for the cost of training and next steps.

Industry also requested that no importation taxes be charged for the micronutrient premix. Preliminary research shows that there are no local sources for micronutrient premix and that all of it will be imported from South Africa.

- Government is encouraged to grant this tax exemption as it will support industry and build good will. Losses in tax revenues could be off set by charging for “certification.”

Trade Association

- Pursue the long-term goal of developing trade associations. While it can be challenging to bring together competing companies to work as one, it could greatly benefit fortification by evoking peer pressure among members to fortify and by enabling the sharing of technical advances and norms with regards to blending and sampling. A well-organized trade association could also design and fabricate custom, low cost blending equipment for their members.

IMPLEMENTATION OF SECOND PHASE:

75% of the wheat flour and vegetable oil market fortifying by the end of 2016

Once again, it is critical to understand the industry make-up in order to target the producers that will have the great impact in this second phase. The suggestions for this phase are general, but will assume that the first year will focus on large local producers, and the second year will focus on large importers.

- Identify large importers in both of these industries and communicate the fortification program, its requirements and objectives.
- Invite importers to participate/share costs in social marketing campaigns that feature fortified foods.

IMPLEMENTATION OF THIRD PHASE:

99% of the wheat flour and vegetable oil market fortifying by the end of 2017

This phase will most likely focus on small producers. These are the groups of producers that are the most difficult to reach in regards to training and monitoring. Here are a few ideas that would help support this group:

Trade Association

- This activity is mentioned in phase 1 as a long-term goal that will help build solidarity in the industry as well as capacity and peer pressure with regards to fortification. A strong trade union will help support medium and small producers.

Evaluate Fortification's Impact

- It might be appropriate to collect some biological data at this point and compare it with base line data in order to evaluate the impact of fortification in relation to current consumption data. Modifications could then be made to standard formulas and other foods could be considered for inclusion, should consumption habits change.
 - Possible rice fortification – As part of agricultural reform, rice production in Mozambique continues to increase and may be sufficient to meet the entire domestic

demand between 2017 and 2018. According the Agriculture Minister Jose Pacheco, Mozambique has an average annual consumption of around 600,000 metric tons of rice. In a 2012-13 agricultural drive, rice production increased by 100,000 tons.ⁱⁱ

- From a technical point of view, bread is a good vehicle for iodine and has been shown to be an effective way of ensuring a constant supply of dietary iodine. If it is proving difficult to fortify all the salt, at minimum it could be a requirement that all salt used in baking bread be fortified.

CHAPTER 7: FINANCIAL MODEL TO SUPPORT FORTIFICATION

It is recommended to develop a cost–benefit model that could compare the monetary cost of fortification interventions with the return, expressed in terms of decreased health care costs and increased productivity, would be extremely valuable in evaluating fortification in relation to other health interventions and other kinds of government spending.

It would be wise to construct model before the official launch of the first fortification phase and populate it with the needed baseline data. Theoretically, the effects of fortification can be measured after 6 months, although collecting biological data after a year is more practical.

The base line data that would need to be inputted, in addition to the costs by industry and government for implementing the fortification program, is detailed below and falls into three categories: Demographic, Economic, and Health.

National Demographic Data

- Population
- Total Population
- Population Working Age Adults 15-65 (or Working Age)
- Population Male Adults 15-65 (or Working Age)
- Population Female Adults 15-65 (or Working Age)
- Population Children <15 years old
- Population Children 6-59 months
- Healthy Life Expectancy¹ (Male and Female Combined)
- Healthy Life Expectancy, Males
- Healthy Life Expectancy, Females
- Birth Rate or # Annual Births
- Average Maternal Age at Birth of First Child
- Birth Growth Rate (%/yr)
- Population Growth (%/yr)

National labor and economic statistics are needed in order to translate the number of people suffering from economic deficits associated with their micronutrient deficiency into financial terms, i.e. local MZN currency. The key data needed to drive the calculations in a model are detailed below:

Labor Participation Rates for men, women and all workers

- Average Length of Working Life
- Average age of entering workforce
- Average length of work life
- Average age of maternal death

Wage Structure

- Average Annual Earnings per working adult participating in the labor force
- Average Annual Earnings per working adult engaged in manual labor
- Average Annual Earnings per working female engaged in manual labor

These two data groups would need to be added to the national health data below:

Population Health Data

Demography

- Annual births
- Annual Population Growth Rate
- Annual Birth Rate

Mortality Data

- Maternal Mortality
- 6-59 month Mortality o Neonatal Mortality

Prevalence of Micronutrient Deficiencies

- VAD among children 6-59 months
- Pre Anemia and Iron Deficiency Anemia among Pregnant Women
- Iron Deficiency Anemia in Children 6-59 months
- Iron Deficiency Anemia Working Age Women
- Iron Deficiency Anemia in Working Age Men

Once the baseline data has been entered, the project's phased coverage would be added to estimate the anticipated effectiveness leading to potential benefit.

This benefit would be contrasted to the cost of the fortification to obtain an anticipated return on investment. The model could be designed to give a range of potential outcomes, varying from least to most optimistic.

Tracking a statistically significant sample of the population a year after the project will prove the data to validate the model's projections.

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¹ http://usa.chinadaily.com.cn/business/2014-02/11/content_17277070.htm

ANNEX A

Draft legislation

Technical standards
